



# **ENERGY STAR<sup>®</sup>**

## **Room Air Conditioners**

***Draft 1 Version 3.0***  
**Stakeholder Webinar**  
**January 11, 2011**

**Amanda Stevens, U.S. EPA**

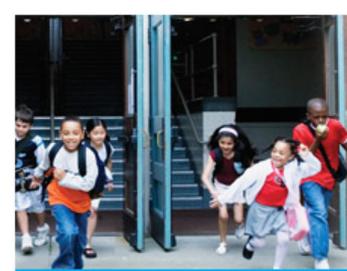
**Ryan Fogle, D&R International**

# Webinar Goals

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1. Highlight proposed changes in the Draft 1 Version 3.0 specification
2. Solicit feedback on proposals and outstanding issues
3. Address stakeholder questions about process and/or changes
4. Identify new potential opportunities, next steps and timeline for Version 3.0



# ENERGY STAR Room Air Conditioner Program



- **1997:** ENERGY STAR RAC program is formed; To qualify, RACs must be 15% more efficient than Federal standard.
- **2001:** Program criteria modified to be 10% more efficient than new Federal standard
- **2003:** Program expands to include models without louvered sides, casement models, and slider-casement models.
- **2005:** Program expands to include reverse cycle (louvered and non-louvered) models.
- **2010:** Version 2.1 finalized; contained changes to specification and new program requirements in anticipation of new January 1, 2011 Third-Party Certification Requirements.
  - Note: Changes to Partner Commitments will be carried over into Version 3.0
  - Version 2.1 Available:  
[http://www.energystar.gov/index.cfm?c=product\\_specs.pt\\_product\\_specs](http://www.energystar.gov/index.cfm?c=product_specs.pt_product_specs)
- **2010/2011: Version 3.0 specification revision**



# ENERGY STAR Appliance Program



- New challenges and opportunities
  - Transition from DOE to EPA
  - Specifications will be more frequently reviewed; scoping efforts to develop new program opportunities.
  - January 1, 2011: third-party certification across all product types
- Maintaining strong brand is priority
- Memorandum of Understanding (MOU) between EPA and DOE explains how ENERGY STAR will prioritize specification revisions
  - *“For appliances and other product categories with longer-lived product models, specifications will be reviewed for a possible revision at a **minimum of every three years** or once the market share for ENERGY STAR qualifying products reaches **about 35%.**”* [www.energystar.gov/mou](http://www.energystar.gov/mou)



# ENERGY STAR Guiding Principles



ENERGY STAR criteria are designed to balance a varied set of objectives, including:

- Significant energy and/or water savings
- Cost effectiveness
- Energy consumption can be measured and verified with testing
- Equivalent or enhanced functionality and performance
- Efficiency improvements available via several technology options; at least one of which is non-proprietary
- Meaningful product differentiation through labeling

# Specification Development Cycle





# RAC Revision: Drivers & Goals



## Drivers:

- Market share has exceeded 35% trigger
  - 36% in 2009; was as high as 50% in recent years
- The current criteria have not been updated since 2001
  - EPA will be reviewing criteria for appliances at least every three years
- Higher efficiencies are technologically feasible and cost effective
- Likelihood of more stringent Federal standards for room air conditioners in 2014; In addition, new Canadian standards expected to take effect January 2011

## Goals:

- More effectively designate high performing models for consumers by reducing market share of ENERGY STAR room air conditioners
- Realize significant cost-effective energy savings and environmental benefits, on a national basis

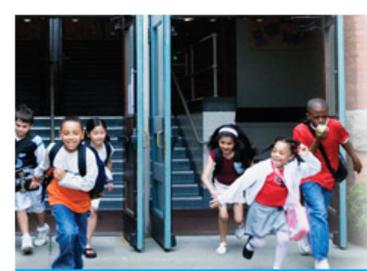




# Summary of Draft 1 Version 3.0



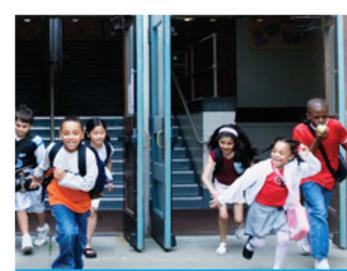
- Proposed increases to EER levels
  - From 10% → 15% better than current Federal standards, harmonizing with current CEE Tier 1 requirement.
- Proposed revisions and clarifications to definitions and scope
- Consideration to harmonize with DOE sampling requirements for certification
- Request for feedback on additional RAC opportunities that could be addressed in this Version 3.0 revision or future revisions.
- Anticipated timeline for Version 3.0 revision: Final version in May 2011, to be effective 9 months later (February 2012), in time for 2012 cooling season.



# Scope and Definition



- **Program Scope:**
  - Includes Room Air Conditioners as defined in Draft 1 Version 3.0, with the exception of Packaged Terminal Air Conditioners (PTACs), portable air conditioners, and models with electric resistance heat as the primary heat source.
  - EPA has incorporated clarification that products with electric resistance heat as a primary heat source are excluded from the program.
- **Definitions:**
  - *RAC, PTAC, Casement-only, Casement-slider, and Basic Model* have been harmonized with DOE definitions.
  - Minor edits were made to definitions for *Reverse Cycle RAC (based on ASHRAE 58)* and *Energy Efficiency Ratio*.
  - New definitions were added for *Portable Air Conditioner (based on CSA C370-09)*, and *Louvered Sides*
  - EPA seeks feedback on any of the definitions in Section 1.



# Test Requirements



- EPA is considering the use of DOE sampling requirements for certification to determine the number of units to be tested for ENERGY STAR qualification.
  - Currently, Version 2.1 requires only 1 representative unit to be tested.
  - 10 CFR 430.24 (f)(1)(ii): For each basic model of room air conditioners, a sample of sufficient size shall be tested to insure that -
    - (ii) Any represented value of the energy efficiency ratio or other measure of energy consumption of a basic model for which consumers would favor higher values shall be no greater than the lower of (A) the mean of the sample or (B) the lower 97 1/2 percent confidence limit of the true mean divided by .95.
- *Note: EPA is aware that DOE will soon publish a certification and enforcement final rule, with amendments that affect RAC sampling requirements.*
- EPA requests stakeholder feedback on its consideration of harmonizing with DOE's latest sampling requirements.



# Proposed EER Criteria



Units Without Reverse Cycle		
	ENERGY STAR EER (with louvered sides)	ENERGY STAR EER (without louvered sides)
Less than 6,000 Btu/hr	≥ 11.2	≥ 10.4
6,000 to 7,999 Btu/hr		
8,000 to 13,999 Btu/hr	≥ 11.3	≥ 9.8
14,000 to 19,999 Btu/hr	≥ 11.2	
20,000 Btu/hr or more	≥ 9.8	
Units With Reverse Cycle		
< 14,000 Btu/hr		≥ 9.8
≥ 14,000 Btu/hr		≥ 9.2
< 20,000 Btu/hr	≥ 10.4	
≥ 20,000 Btu/hr	≥ 9.8	
Casement Units		
Casement-only	≥ 10.0	
Casement-slider	≥ 10.9	



# Technology Options



- Current design options include:
  - Better heat exchangers
    - Microchannel
    - Microgroove
  - More efficient compressors
  - Improved expansion devices
  - More efficient fans/blowers and fan/blower motors
- In 2010, manufacturers and efficiency advocates reached agreement on new proposed standard levels for RACs (from 10-15% better than current standard).



# Product Availability



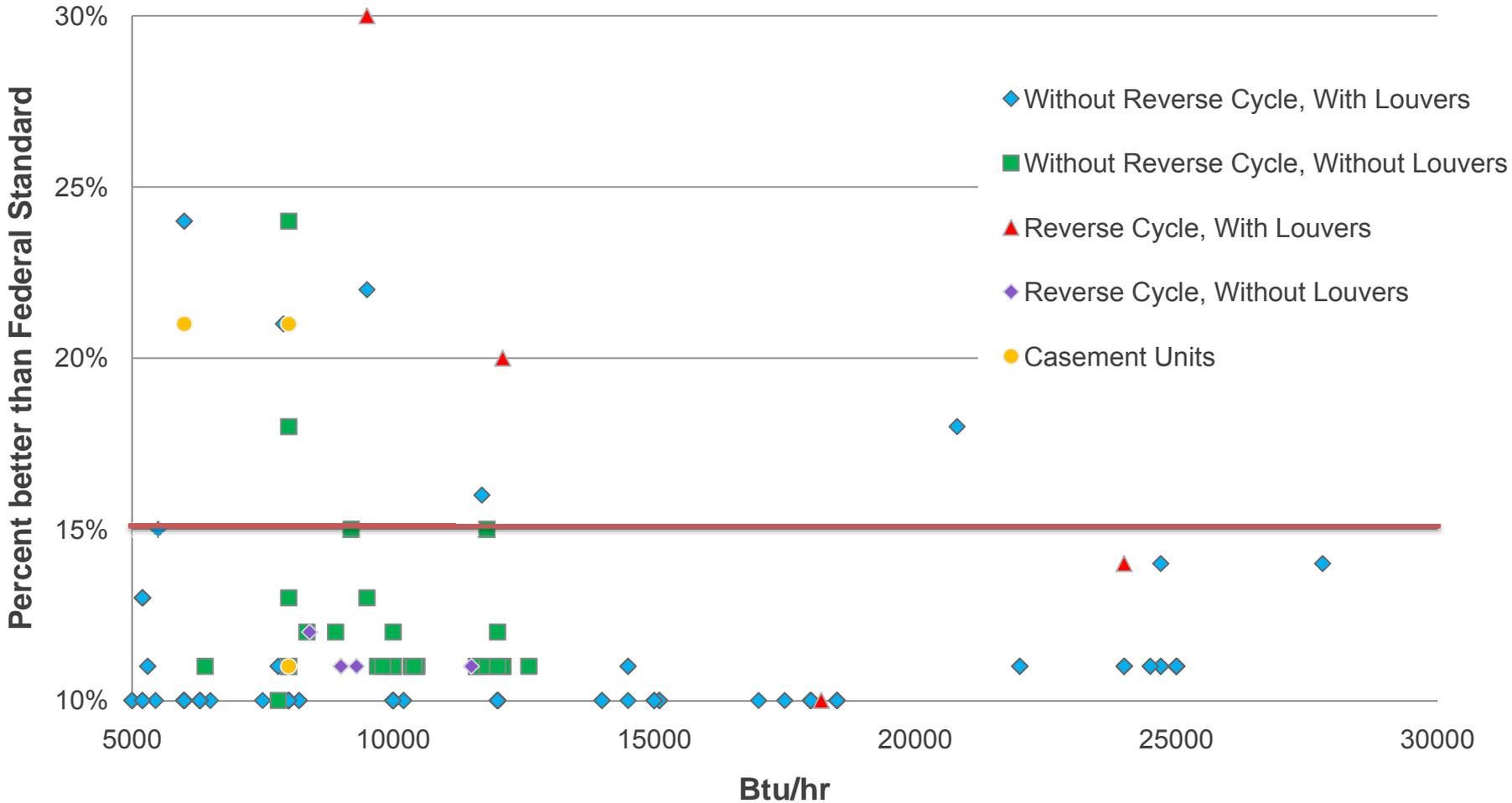
- On the current ENERGY STAR Qualified Product list, 20 RACs (of the 790 total models on market) meet the proposed 15% ENERGY STAR criteria.
- Of traditional (louvered sides, no reverse cycle) room air conditioners, seven models current meet the 15% criteria level, including:
  - 4            8,000 Btu/hr (nearly 50% of the total RAC market)
  - 2            8,000-13,999 Btu/hr (about 33% of the total RAC market)
  - 0            14,000-19,999 Btu/hr (about 5% of the total RAC market)
  - 1            20,000+ Btu/hr (< 3% of the total RAC market)

# Product Availability by Manufacturer



Current ENERGY STAR 10% more efficient	Proposed ENERGY STAR 15% more efficient
Airwell-Fedders	Danby (1)
Daewoo	Electrolux (3)
Danby	Friedrich (8)
Electrolux	Gree (6)
Friedrich	Haier (2)
GE	
Gree	
Guangdong Chigo Air-conditioning Co. Ltd	
Haier	
Heat Controller	
Kelon USA	
LG Electronics	
Midea USA	
Sharp	
Sunpentown	

# RAC Efficiencies





# Annual Unit Energy Savings



Model	Annual Energy Use (kWh/yr)	Potential Savings (kWh/yr)
	Federal Standard	15% Better Than Federal Standard
Traditional RAC 6,000 Btu/hr	688	98
Traditional RAC 8,000-13,999 Btu/hr	672	96
Traditional RAC 20,000 or more Btu/hr	1,118	152
8,000-13,999 Btu/hr without louvered sides	712	101

Note: Based on energy use data in DOE RAC TSD.





# Price Premium & Payback



Product Class	Baseline Price* (\$)	15% Better Than Federal Standard			
		Price Premium* (\$)	Annual Savings** (\$)	Payback (years)	Lowest Retail Price Found*** (\$)
Traditional RAC 6,000 Btu/hr	270	33	10.5	3.2	270 (Haier)
Traditional RAC 8,000-13,999 Btu/hr	388	54	10.3	5.3	949 (Friedrich)
Traditional RAC 20,000 or more Btu/hr	658	91	16.2	5.6	1259 (Friedrich)
8,000-13,999 Btu/hr without louvered sides	456	33	10.7	3.1	322 (Haier)

Note: \*From DOE RAC TSD published in February 2010.

\*\* Assumes national average electricity rate of \$0.1068 per kWh

\*\*\* Obtained through online searches conducted in December 2010



# Utility and State Rebates



- 57 utilities offered rebates on room air conditioners in 2009.
  - The regions with the most rebates were California, the Upper Midwest, and New England

Top Regions	Number of Rebates	Average Rebate (\$)
California	12	50
Upper Midwest	21	28
New England	6	24

- Other rebate sources include SEEARP, with 27 states and territories offering rebates.
  - Rebates ranged from \$25-\$75.



# Further RAC Opportunities: Fan Only Use



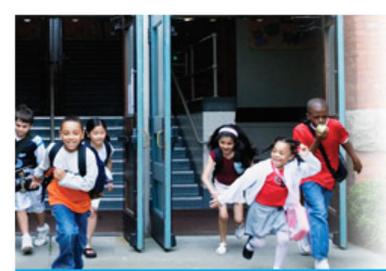
- Fan-only operation is not addressed by the DOE test procedure
  - EPA understands that most RAC products have at least 1 of the 2 following modes:
    - “Fan mode” – Used to circulate air in room, and provide ventilation if there is a fresh-air intake or exhaust setting
    - “Eco/Energy/Money Saver mode” – Fan is automatically turned off when the compressor shuts off
- EPA seeks feedback on the opportunity for energy savings through addressing fan functionality.
  - EPA requests stakeholder feedback on the energy savings associated with turning fan off when compressor shuts off; data on how commonly consumers use the optional “Eco/Energy/Money Saver” mode; and whether additional energy savings could be realized through more widespread use of this mode.



# Further RAC Opportunities: Thermal Bridging and Air Leakage



- Thermal Bridging and Air Leakage
  - RACs form a thermal bridge that conducts heat from the home in the wintertime and into the home in the summertime. Energy losses can also occur as a result of air infiltration through or around the RAC.
- EPA is interested in potential savings opportunities by reducing thermal bridging and/or air infiltration.
  - Are stakeholders aware of studies or data that characterize the magnitude of RAC losses associated with thermal bridging and air infiltration?
  - What design enhancements can reduce thermal bridging and air infiltration?



# Further RAC Opportunities: Reverse Cycle



- The efficiency of RACs in heat mode is not currently addressed in the ENERGY STAR specification nor is it measured in the federal test procedure.
- EPA notes that other programs have addressed the heating and cooling efficiency of these products.
  - Research indicates that it is important to look at both the heating and cooling of these models.
- EPA is evaluating the opportunity address the energy use of reverse cycle RACs in heating mode and is interested in any stakeholder feedback regarding the efficiency of RACs in heat mode.



# Further RAC Opportunities: “Smart” RACs



- Potential “Smart Appliance” opportunities for RACs include:
  - Participation in DR programs
  - Communication with Energy Management Systems (EMS)
  - Time of Use pricing awareness
- EPA is considering a requirement that RACs be user-upgradable to support Smart Grid/EMS communications capabilities and is investigating the associated savings and carbon emission reduction potential.
- EPA also seeks feedback on the incremental cost with this upgradeability and any associated potential energy consumption penalty from the communications transceiver and other added electronics.



# Further RAC Opportunities: Environmental Impact of Refrigerants



- Many refrigerants, including the currently used R-410a, are powerful greenhouse gasses
  - Refrigerant used in average RAC is equal to 1-1.5 metric tons of CO<sub>2</sub> per unit
- Low global warming potential alternative refrigerants are being developed and tested
- EPA seeks comment on technologies, best practices, and alternatives, that may be incorporated into ENERGY STAR RAC program to reduce the refrigerant-related climate impacts of RACs.



# Further RAC Opportunities



- EPA is interested in any stakeholder comment on any RAC opportunities that were not discussed in the previous slides.



# Anticipated Timeline



January 11, 2011	Stakeholder webinar on Draft 1 specification
January 26, 2011	Comment period closes on Draft 1 specification. <i>[Note: EPA has extended the comment period by one week]</i>
February/March 2011	Draft 2 specification distributed, stakeholder webinar or meeting, and comment period.
March/April 2011	Final Draft specification distributed <sup>1</sup> stakeholder webinar or meeting, and comment period.
May 2011	Final specification posted
February 2012	Final specification effective

<sup>1</sup> EPA may propose additional draft specifications before issuing a Final Draft.

EPA welcomes all stakeholder comments on Draft 1 by **January 26, 2011**. Comments should be submitted in writing to [appliances@energystar.gov](mailto:appliances@energystar.gov)



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